



UNITED STATES PATENT AND TRADEMARK OFFICE

9/11
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/686,091 | 10/15/2003 | Tongbi Jiang | 01-0219.1 | 6830 |
| 22823 | 7590 | 05/06/2004 | EXAMINER | |
| STEPHEN A GRATTON THE LAW OFFICE OF STEVE GRATTON 2764 SOUTH BRAUN WAY LAKEWOOD, CO 80228 | | | NGUYEN, HA T | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2812 | |

DATE MAILED: 05/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/686,091

Applicant(s)

JIANG, TONGBI

Examiner

Ha T. Nguyen

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 36-78 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 36-78 is/are rejected.
- 7) ☒ Claim(s) 37,44,45,52,68 and 73 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>10-15-3</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Objections

1. Claims 37, 52, and 73 are objected to because of the following informalities: In claims 37 and 52, lines 2, substitution of “a” with --an-- and in claim 73, line 2, before “eutectic”, insertion of --an-- are suggested for correctness/clarity. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 36 and 53 are rejected under 35 U.S.C. 102(a) as being anticipated by Masayoshi et al. (JPN 2002-170847, hereinafter “Masayoshi”).

Referring to Figs. 4-10 and related text, Masayoshi discloses an underfill material for encapsulating connections between a semiconductor component and a substrate comprising: an electrically insulating polymer base material 8 configured for deposition onto the substrate or the component as a non-flowing viscous material; and a plurality of Sn particles 9 in the base material configured to melt and to rigidify the connections; Sn is inherently a solder material; the metal particles comprising a metal selected from the group consisting of Sn, Pb, Ag, Au, Ge, Cu and In (see Problem to be solved).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103[©] and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 38-41, 54-64, 71, 72, and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masayoshi.

[Re Claims 58, 60, 71, and 72] Masayoshi also discloses an electronic system comprising: a semiconductor component 2 comprising a plurality of terminal contacts 7; a substrate 1 comprising a plurality of substrate contacts 5; a plurality of connections between the terminal contacts and the substrate contacts; and an underfill layer 3 attaching the component to the substrate and encapsulating the connections, the underfill layer comprising a polymer base material and a plurality of conductive particles in the base material at least some of which are bonded to the connections and the substrate contacts; wherein the particles comprise Sn, an inherent solder (see par. 19-21). But it does not disclose expressly the terminal of the semiconductor component is of solder. However, the missing limitation is well known in the art because Masayoshi discloses the terminals of the substrate are of solder (See par. 22). A person of ordinary skill is motivated to modify Masayoshi to have solder terminals on the semiconductor component instead of on the substrate to obtain the same result .

[Claims 38, 54, and 61] Masayoshi wherein the particles have a diameter of from 1 μm to 10 μm (see par. 21);

[Claims 59 and 78] wherein the substrate comprises a module substrate and the system comprises a multi chip module (see par. 32 and Figs.7-8).

[Claims 39-41, 55-57, and 62-64] Masayoshi does not disclose the volume percentage of the particles relative to the total volume of underfill material. However, it would have been obvious for a person of ordinary skill to have less than 50% volume of particles to ensure that the underfill material is still insulating.

5a. Claims 42-43, 46, 65-67, 69-70, and 76-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masayoshi in view of Chen et al. (USPN 6260264, hereinafter "Chen") and Semi Conductor Data (hereinafter "Engelhard").

Masayoshi discloses substantially the limitations of claims 42-43, 46, 65-67, 69-70, and 76-77, as shown above. It also discloses a polymer base material comprises a material selected from the group consisting of epoxy, silicone and polyimide and the use of PbSn solder (see pars. 21-22).

But it does not disclose expressly the viscosity of the polymer base material, volume percentage and the melting temperature of the solder particles.

However, the missing limitations are well known in the art because Chen discloses a large range of viscosity from about 1000 to about 30000 poise can be used, the base polymer material would be higher depending on the amount of filler used (see col. 4, lines 1-17), for an insulating filler a volume percentage of more than 50% is required (see col. 3, lines 11-34) and Engelhard discloses tin alloys having melting temperature of from 150C to 250C (see third page). The combined teaching does A person of ordinary skill is motivated to modify Masayoshi with Chen and Engelhard to obtain underfill material of appropriate viscosity for ease of fabrication.

Therefore, it would have been obvious to combine Masayoshi with Chen and Engelhard to obtain the invention as specified in claims 42-43, 46, 65-67, 69-70, and 76-77.

6. Claims 47-51 and are rejected under 35 U.S.C. 103(a) as being unpatentable over Masayoshi in view Engelhard and Uchiyama (USPN 6356333).

The combined teaching of Masayoshi and Engelhard discloses substantially the limitations of claims 47-51, as shown above.

But it does not disclose expressly the use of curing agent.

However, the missing limitation is well known in the art because Uchiyama discloses this feature (See col. 7, lines 12-57).

A person of ordinary skill is motivated to modify Masayoshi with Engelhard and Uchiyama to obtain curing at low temperature.

Therefore, it would have been obvious to combine Masayoshi with Engelhard and Uchiyama to obtain the invention as specified in claims 47-51.

6a. Claims 74-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masayoshi in view of Chen.

The combined teaching of discloses substantially the limitations of claims 74-75, as shown above in the rejection of claims 42-43, 46, 65-67, and 69-70.

Allowable Subject Matter

7. Claims 37, 44-45, 52, 68, and 73 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and overcoming the objection for informalities.

Claims 37, 44, 52, and 73 recite the particles comprising an eutectic solder, claim 45 recites a SnAgCu solder; claim 68, particles comprising a second solder alloy .

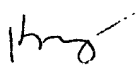
These features in combination with the other elements of the claims are neither disclosed nor suggested by the prior art of record.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Neibling, can be reached on (571) 272-1679. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Ha Nguyen
Primary Examiner
04- 30 - 04